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(54) **HIGH GLOSS LABEL FACE STOCK**

MATERIAL FÜR HOCHGLANZETIKETT

MATERIAU POUR FACE APPARENTE D'ETIQUETTE A FORTE BRILLANCE

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Description

This invention relates to the field of adhesively applied lab ls. In particular the invention relates to biaxially oriented polymer film structures employed as adhesively applied labels.

Of recent years polymeric films have boon utilized to take the place of paper for product labels and the like. Synthetic film labels are stronger and in some respects easier to handle in automatic machinery employed for applying labels to products.

A typical system employs a release layer which carries a label removable therefrom. The label carried by the release substrate has a pressure sensitive adhesive on one side and product identifying indicia or other information on the other. The release layer is composed of a substrate which has a surface to which the label adhesive will not aggressively adhere. The release characteristics of the substrate and the adhesive are such that when the substrate is bent through a certain angle, the stiffness of the label will cause it to separate from the release surface in spite of the presence of the adhesive. This will permit a container or product to be interfaced with the adhesive layer so that the label will transfer from the release surface to the product to be labeled. This technique happens rapidly and sequentially in automated mechanism. One shortcoming in general with the use of polymeric films for label stock is that they cannot esthetically compete with opaque gloss coated paper for pressure sensitive or activatable adhesive-label face stock applications. Therefore, it is an abject of the present invention to present a synthetic film-adhesive label face stock having high gloss and thus the ability to esthetically compete with coated paper stock for label purposes.

U.S. 4,965,123 discloses an opaque film having a voided polypropylene core with skin layers.

U.S. 4,377,616 discloses an opaque film having a voided core an non-voided skin layers.

The opaque label stock of the present invention includes the following multilayer structures:

(a) an oriented thermoplastic polymer matrix core layer having a first surface and a second surface. Within the matrix is located a strata of voids and positioned at least substantially within a substantial number of said voids is at least one spherical void-initiating particle which is phase distinct and incompatible with said matrix material. The void space occupied by said particle being substantially less than the volume of said void, with one generally cross-sectional dimension of said particle at least approximating a corresponding cross-sectional dimension of said void; the population of said voids in said core being such as to cause a significant degree of opacity;

(b) a first high gloss medium density polyethylene skin layer adhering to said first surface of said core layer;

(c) a second thermoplastic polymer skin layer adhering to said second surface of said core layer; and

(d) an adhesive on the surface of said thermoplastic skin layer.

In many instances the adhesive will be a pressure sensitive adhesive. In other cases the adhesive may be one activatable by any means, such as, heat and solvent. For its best utility the above described label structure is carried by a release surface wherein the release characteristics of the surface of the release sheet permits the label stock to be readily removed therefrom so as to be applied to some other surface.

For use as a base or core layer for label stock purposes this material must be opaque, preferably white opaque, in order to provide an excellent contrasting background for printed material applied to the label stock. A material which has the good characteristics of excellent tensile strength, low permeability to moisture and other liquids is a polypropylene core material cavitated in a special way so as to produce a pearlescent opaque appearance. A material of this type is described in U.S. Patent 4,377,616.

In accordance with this patent the process of preparing the opaque film structure is as follows: a major proportion of a first thermoplastic polymeric material, e.g. polypropylene, is mixed with a minor proportion of a second material of a higher melting point or of a high glass transition temperature than the first material. This mixture is heated to a temperature at least above the melting point of the first material. Thereafter the second material is uniformly dispersed throughout the molten first material in the form of microspheres. The microspheres can be conveniently prepared in a master batch of, e.g. polybutylene terephthalate, microdispersed in molten form in molten polypropylene. This combination is then coextruded so as to have a thin skin layer on opposite surfaces of the core combination of materials. Thereafter this arrangement is biaxially oriented at a temperature and to a degree to form a strata of opacifying closed cell voids of dimensions X, Y and Z. Dimensions X and Y are major dimensions and dimension Z is a minor dimension at least generally corresponding to the diameter of the microspheres. In some cases the skin films are substantially void-free in others there are advantages including certain inorganic void initiated particles, particularly in the skin closest to the adhesive. The material dispersed as microspheres throughout the molten core material can be polybutylene terephthalate, nylon, solid or hollow preformed glass spheres, metal beads or spheres, ceramic spheres, calcium carbonate, etc.

As indicated the preferred core material is polypropylene, particularly preferred is an isotactic polypropylene containing at least about 80% by weight of isotactic polypropylene. It is also preferred that the polypropylene

have a melt flow index of from about 2-10g/10 minutes.

It is preferred that the average diameter of the void-initiating particles be from about 0.1 to about 10 microns. These particles may be of any desired smooth shape, although it is preferred that they be substantially spherical.

The skin material coextruded onto one surface of the core to be cavitated is a medium density polyethylene. By this is meant that the density of the polyethylene can be anywhere from about 0.926 - 0.945. Such a medium density polyethylene when formed into one of the skins of the label stock structure will have a 45° gloss of 50 or greater. This gloss characteristic is at least as good as or better than commercially available coated paper label stock. It is to be understood that both sides of the cavitated core material may be extrusion coated with medium density polyethylene. It is also contemplated that one side may carry the medium density polyethylene layer while the opposite surface may carry no skin layer or may have any one of a variety of other skin surfaces. For example, the opposite skin material can be noncavitated polypropylene, a copolymer of ethylene and propylene, where the proportion of ethylene is from 2-8%, a terpolymer of ethylene, propylene, butene-1, etc. This skin surface can be any material which will aggressively receive thereon a coating of a pressure sensitive adhesive. This aggression must be sufficient to remain in contact with the skin layer when separation occurs between the adhesive and a release surface carrying the same. The second skin layer may include an inorganic material such as calcium carbonate to provide for improved label cutting.

In the art of labeling, the label which is to be applied to a surface or a product is normally carried by a release sheet or surface. A common example of this type of label structure familiar to most automobile owners is the county or city registration sticker which must be applied to a windshield. This type of structure comprises a release sheet, one side of which has a release surface of a silicone material or the like. Carried on this surface is a pressure sensitive adhesive and applied to the pressure adhesive is the label or decal to be applied to a windshield. Of course the adhesive may first be applied to the label before mating with the release liner. When the decal or label is separated from the release sheet the pressure sensitive adhesive preferentially adheres to the label or decal and by this means is affixed to the windshield of the car. For the labeling of cans or bottles obviously a more automated system must be employed. In providing for a more or less continuous labeling system, a continuous release roll is prepared by applying to one side of a continuous substrate, which may be paper or polymeric film, and which may be of a single or multiple layers, a release coating of silicone or the like. Thereafter, for example, the release face of the release linear is coated with a layer of pressure sensitive adhesive. Thereafter, a label stock as described above which has been or will be printed with the appropriate label indicia, is brought into mating contact with the pressure sensitive adhesive. Following this mating, printing can be accomplished if not already completed and individual labels can be die-cut severed in a manner well known to the art. Following this procedure labels then can be sequentially individually applied to a product surface by causing the individual labels to separate from the release surface and having the adhesive side of the label contact the product to be labeled.

As indicated above, instead of a pressure sensitive adhesive, activatable adhesives can be employed for certain labeling techniques. For instance, when a label is to be applied about the full circumference of a package or bottle a water or other solvent can activate an adhesive stripe or strip applied to one end of the label. The label is then fixed in place by a slight overlap of the other end of the label.

It has also be discovered that die cutting of labels is materially enhanced by including in organic particles, such as calcium carbonate in the label skin layer close to the adhesive and release layer. These particles also cause some cavitation. The following illustrates the beneficial distinctions between employing a medium density polyethylene as the label surface in comparison with high density polyethylene of coated paper label stock for the same purpose.

EXAMPLE

Three resin formulations are melted and coextruded through a sheet die to form a three layer 80 mil sheet:

LAYER A: 92% Medium Density Polyethylene (MDPE)+8% TiO_2

LAYER B: 94% Polypropylene homopolymer + 6% polybutylene terephthalate

LAYER C: 85% Polypropylene homopolymer + 15% $CaCO_3$

The sheet is quenched, reheated and stretched 4-6 times in the machine direction at a temperature between the T_g and the melt temperature of the polypropylene homopolymer. Subsequently, the machine direction stretched sheet is stretched 8-10 times in the transverse direction at a temperature between the T_g and the melt temperature of the polypropylene homopolymer to produce a finished, cavitated core film between 2.6 and 3.0 mils thick. Both sides of the film are corona discharge treated to 38 dynes/cm or greater prior to winding in mill roll form. This technique is repeated employing different medium density polyethylenes and a high density polyethylene as shown in the following results. The label stock employing medium density polyethylene having a density of 0.941 and a melt index of 4 has a 45° gloss value of 57. The label stock employing the medium density polyethylene of 0.937 density and a melt index of 2.5, has a 45° gloss

reading of 56. The label stock employing a high density polyethylene having a density of 0.960 and a melt index of 3 has a 45° gloss reading f 44. The gloss readings of the medium density polyethylene label stock compared favorably or better than commercially available coated paper label stock and, as shown, are clearly superior to high density polyethylene. The coated paper compared was a clay coated calendered paper identified as Kromekote from champion International Co. This had a 45° gloss of 30.

The label stock of the present invention constitutes an excellent surface for water-based flexographic, UV/letterpress, and solvent-based UV-cure screen printing inks.

Claims

1. An opaque, biaxially oriented, polymeric label stock structure, comprising:

   (a) a voided core layer comprising a matrix of polypropylene in which are dispersed thermoplastic polymeric void-initiating solid particles which are phase distinct from the polypropylene, of the matrix and about which particles are located opacifying voids;
   (b) a medium density polyethylene skin layer adhering to the first surface of the core layer this skin layer having a 45° gloss of 50 or greater;
   (c) a thermoplastic polymer skin layer adhering to the second surface of the core layer; and
   (d) an adhesive on the second surface of the thermoplastic polymer skin layer (c).

2. A film according to claim 1 wherein the adhesive comprises a pressure sensitive adhesive.

3. A film according to claim 1 or 2 wherein the adhesive comprises an activatable adhesive.

4. A film according to any preceding claim wherein both skin layers comprises high gloss, medium density polyethylene.

5. A film according to any preceding claim wherein at least one skin layer is sufficiently thick to prevent the asperities of the core layer being manifest.

6. A film according to any preceding claim wherein the layer (b) includes opacifying titanium dioxide therein.

7. A film according to any preceding claim wherein the skin layer (c) comprise isotatic polypropylene.

8. A film according to any preceding claim wherein the void initiating solid particles comprise polybutylene terephthalate.

9. A film according to any preceding claim wherein the layer (c) includes an inorganic cavitating agent.

10. A film according to claim 9 wherein the cavitating agent comprises calcium carbonate.

11. A film according to any preceding claim wherein the polyethylene has a density of from 0.926 to 0.945.

12. A film according to any preceding claim carried on a release substrate.

13. Use of an opaque, biaxially oriented, polymeric film structure comprising layers (a), (b) and (c) wherein (a), (b) and (c) are defined in any preceding claim in an automated labelling process.

Patentansprüche

1. Opake, biaxial orientierte, polymere Etikettenmaterialstruktur, umfassend:

   (a) eine mit Hohlräumen versehene Kernschicht, die eine Matrix aus Polypropylen umfaßt, in der thermoplastische, polymere, hohlraumbildende, feste Partikel dispergiert sind, deren Phase sich vom Polypropylen der Matrix unterscheidet, und um diese Partikel sind trübende Hohlräume angeordnet;
   (b) eine Hautschicht aus Polyethylen mittlerer Dichte, die an der ersten Oberfläche der Kernschicht haftet, wobei diese Hautschicht einen Glanz bei 45° von 50 oder mehr hat;
   (c) eine thermoplastische Polymerhautschicht, die an der zweiten Oberfläche der Kernschicht haftet; und
   (d) einen Kleber auf der zweiten Oberfläche der thermoplastischen Polymerhautschicht (c).

2. Folie nach Anspruch 1, wobei der Kleber einen Haftkleber umfaßt.

3. Folie nach Anspruch 1 oder 2, wobei der Kleber einen aktivierbaren Kleber umfaßt.

4. Folie nach einem der vorstehenden Ansprüche, wobei beide Hautschichten Polyethylen mittlerer Dichte mit starkem Glanz umfassen.

5. Folie nach einem der vorstehenden Ansprüche, wobei mindestens eine Hautschicht ausreichend dick ist, um zu verhindern, daß sich Unebenheiten der Kernschicht zeigen.

6. Folie nach einem der vorstehenden Ansprüche, wobei die Schicht (b) trübendes Titandioxid enthält.

7. Folie nach einem der vorstehenden Ansprüche, wobei die Hautschicht (c) isotaktisches Polypropylen umfaßt.

8. Folie nach einem der vorstehenden Ansprüche, wobei die die hohlraumbildenden, festen Partikel Polybutylenterephthalat umfassen.

9. Folie nach einem der vorstehenden Ansprüche, wobei die Schicht (c) ein anorganisches, hohlraumbildendes Mittel umfaßt.

10. Folie nach Anspruch 9, wobei das hohlraumbildende Mittel Calciumcarbonat umfaßt.

11. Folie nach einem der vorstehenden Ansprüche, wobei das Polyethylen eine Dichte von 0,926 bis 0,945 hat.

12. Folie nach einem der vorstehenden Ansprüche, die auf einem Trennsubstrat getragen wird.

13. Verwendung einer opaken, biaxial orientierten, polymeren Folienstruktur, die die Schichten (a), (b) und (c) umfaßt, wobei (a), (b) und (c) in einem der vorstehenden Ansprüche definiert sind, bei einem automatisierten Etikettierverfahren.

Revendications

1. Structure d'étiquette polymère, opaque, orientée biaxialement, comprenant :

   (a) une couche centrale dans laquelle des vides ont été formés, comprenant une matrice de polypropylène dans laquelle sont dispersées des particules solides créatrices de vides, à base de polymère thermoplastique, qui forment une phase distincte du polypropylène de la matrice, particules autour desquelles se trouvent des vides opacifiants ;
   (b) une couche de peau à base de polyéthylène moyenne densité adhérant à la première surface de la couche centrale, cette couche de peau ayant une brillance à 45° de 50 ou plus ;
   (c) une couche de peau à base d'un polymère thermoplastique adhérant à la seconde surface de la couche centrale ; et
   (d) un adhésif sur la seconde surface de la couche de peau à base de polymère thermoplastique (c).

2. Un film selon la revendication 1, dans lequel l'adhésif comprend un adhésif sensible à la pression.

3. Un film selon la revendication 1 ou 2, dans lequel l'adhésif comprend un adhésif activable.

4. Un film selon l'une quelconque des revendications qui précèdent, dans lequel les deux couches de peau comprennent un polyéthylène moyenne d n-sité à forte brillance.

5. Un film selon l'une quelconque des revendications qui précèdent, dans lequel au moins une couche de peau est suffisamment épaisse pour empêcher les aspérités de la couche centrale d'apparaître.

6. Un film selon l'une quelconque des revendications qui précèdent, dans lequel la couche (b) comprend du dioxyde de titane opacifiant.

7. Un film selon l'une quelconque des revendications qui précèdent, dans lequel la couche de peau (c) comprend du polypropylène isotactique.

8. Un film selon l'une quelconque des revendications qui précèdent, dans lequel les particules solides créatrices de vides comprennent du polybutylène téréphtalate.

9. Un film selon l'une quelconque des revendications qui précèdent, dans lequel la couche (c) comprend un agent de cavitation inorganique.

10. Un film selon la revendication 9, dans lequel l'agent de cavitation comprend le carbonate de calcium.

11. Un film selon l'une quelconque des revendications qui précèdent, dans lequel le polyéthylène a une densité de 0,926 à 0,945.

12. Film selon l'une quelconque des revendications qui précèdent porté sur un substrat anti-adhésif.

13. Utilisation d'une structure de film polymère opaque, orientée biaxialement comprenant des couches (a), (b) et (c), dans laquelle (a), (b) et (c) sont définis dans l'une quelconque des revendications qui précèdent, dans un procédé d'étiquetage automatisé.